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(54) IMPROVEMENTS IN AND RELATING TO THE OPENING OF PACKAGES

(71) We, TETRA PAK INTERNATIONAL, A.B., a Swedish corporate body of Fack S-221 01, Lund 1, Sweden do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to packaging and more especially to a method for providing in a package a releasable discharge opening having good pouring properties for liquid contents, the container being made from a web or a blank of a plastics-covered, relatively rigid but foldable base material.

Modern disposable packages for liquid contents, e.g. milk and fruit juices, are frequently made from blanks or from a web of laminate packaging material which comprises a relatively rigid, foldable base layer e.g. of paper or foamed plastics, with a layer, generally a continuous layer, of thermoplastics material on the face which is to form the inside of the package. To improve the barrier characteristics, and to protect the outside of the package, the base layer is often laminated with a layer of metal foil or some other gas-tight material and may be provided with an outer plastics layer to protect the container against the absorption of moisture when it is kept in a moist environment.

It is also known for containers of the abovementioned type to be provided with means for opening them to render the contents accessible, without need to use any tool, e.g. scissors. Thus the package wall may be wholly or partly punched through and the hole so identified to be covered by an inner and an outer cover strip which strips are felded together in the area of the hole. When opening such a package the inner cover strip is ripped up when the outer cover strip is removed. These known arrangements have proved to function relatively satisfactorily, but it is sometimes difficult to pour out the contents in an even, continuous and stable flow owing to an edge of the ripped up thin plastics foil being present along the rim of the discharge aperture which tends to alter its position and thereby affects the flow of the poured contents. It is well-known that liquid contents have optimum flow over a sharp square-cut edge when an even and well-defined stream is obtained.

The object of the present invention is to provide packaging material, and package made therefrom, incorporating a releasable aperture which will be free from the aforesaid disadvantage.

With this end in view the invention consists in packaging material in sheet or web form, for forming containers, provided with an aperture sealed by a removable cover, adapted to serve as a discharge outlet in a container formed from the material, wherein the peripheral zone of the aperture is folded back upon the surface of the material round the aperture and a strip of material forming said removal seal, extending over said aperture and said folded-back peripheral zone is bonded to the surrounding surface of the packaging material.

The invention also consists in a method of preparing sheet or web packaging material formed of, or incorporating, a layer preformed with an aperture, wherein a mandrel of larger transverse dimensions than said aperture is forced through the aperture to initiate folding of the peripheral zone of material round the aperture, whereafter folding of said peripheral zone is completed by pressing it down against the surface of the material surrounding the aperture, and a seal extending over said aperture and said folded peripheral zone is bonded to the surrounding area of the material surface.

The invention further consists in apparatus adapted to carry into effect the

method set out in the next preceding paragraph.

The invention will now be described with reference to the accompanying schematic drawings in which, by way of example,

Fig. 1 shows the location of a discharge aperture in accordance with the invention on a parallelepipedic package of known form:

Figs. 2*a* and 2*b* show two different punching patterns for a discharge aperture;

Figs. 3*a* and 3*b* show a cross-section through the webs shown on Figs. 2*a* and 2*b*.

Fig. 4*a* shows a section of the packaging material while the peripheral edge of the aperture is being folded up by a mandrel;

Fig. 4*b* shows the edge, folded up as shown in Fig. 4*a*, folded over and down against the surrounding web surface:

Fig. 5*a* shows a plan view of the packaging material shown in Fig. 2*a* after the edge portions of the aperture have been folded over;

Fig. 5*b* shows a like view of the packaging material shown in Fig. 2*b*:

Fig. 6 shows a section through a finished packaging container, in a plane through the discharge aperture;

Fig. 7 shows a like section through the container after opening;

Fig. 8*a* shows schematically the method of preforming packaging material as a magazine roll, for further processing in accordance with the invention:

Fig. 8*b* represents final treatment and ultimate formation into containers of material formed with discharge apertures in accordance with the invention.

The containers now to be described, provided with opening means in accordance with the invention, are preferably manufactured from a laminate comprising a base material of paper or cardboard covered on each side with a thermoplastics material, preferably polyethylene, and if necessary provided with further lamination layers e.g. of metal foil so as to increase imperviousness to gas. It should be understood, however, that containers manufactured from other materials e.g. a material incorporating a base layer of polystyrene foam plastic, may also be provided with opening means according to the invention.

The perspective view shown in Fig. 1 is of a known packaging container of parallelepipedic shape to which the present invention may be applied. This does not mean that the invention is only of use in packages of this shape and design. Opening means in accordance with the invention may be used in any kind of container manufactured from a sheet in the form of a web or blank. As seen in Fig. 1, the parallelepipedic container 1 is provided with a sealed opening 3 in its upper flat end surface 2. A discharge aperture 4 and a vent 5 covered by an outer sealing strip 6, which is bonded to the end surface 2 of the container 1 over the area around the holes 4 and 5 and is sealed to an inner cover strip (not shown) along the parts of the same which face it in the holes 4 and 5. The aperture 4 is located close by, or near to, one side edge 7 of the flat end surface 2 of the package, in order to facilitate the pouring of the contents, and the vent 5 should be arranged at such a distance from the aperture 4 that during normal pouring air can enter into the container at the same rate as the contents are poured out, so as to compensate for the diminution of volume remaining in the package as the contents are discharged. If the aperture 4 in Fig. 1 is not provided with a relatively sharp square-cut rim, the contents tend, at least when the inclination of the container is only slight, to run over the upper surface of the container to the side edge 7. Since the folding of the package material cannot be sharp, but is slightly rounded at this edge the contents or part thereof flowing to this edge easily run down the side wall of the container 1. As mentioned previously, it is the object of the present invention to avoid these inconveniences which tend to ease when opening known packages. As will be described below the packaging material is processed to provide an improved discharge aperture.

The packaging material may consist of a continuous web or of separate blanks, but since modern machines operate preferably with a continuous web, supplied in the form of a magazine roll, the following description will refer to the processing of material in the form of a flat web.

Referring to Figs. 8*a* and 8*b*, the processing preferably takes place in two stages. In Fig. 8*a* a web 28 of a packaging material is drawn off a magazine roll 27. The web 28 may consist of a layer of paper or cardboard, or, as mentioned earlier, of a layer of other material, e.g. polystyrene foam plastics. The web 28 may be covered in advance with a layer of plastics material on one, or on each, side. If desired the laminate web may include a gas-tight layer, preferably of aluminium foil or an impervious plastics material such as polyvinylidene chloride or the vinyl-acrylic material marketed under the registered Trade Mark BAREX. The web 28 from the roll 27 is conducted past punching means 29, by which a repeated pattern of the aforementioned pouring and vent holes is punched into the web, one pouring hole and one vent being provided in each length of the web which is to constitute the material for one container. The said pouring and vent holes are so located on the web that on the finished package they will be located in the manner as specified above and shown in Fig. 1.

Figs. 2*a* and 2*b* illustrate different config-

urations of the discharge aperture. In Fig. 2*a* the aperture 9 is shaped as a four-pointed star punched into the web or blank 8. Between neighbouring points 17 of the star, crease lines 11 are provided to facilitate the folding of the edge zones. In Fig. 2*b* the aperture 10 is a substantially circular hole in the web 8, and to facilitate the folding of the peripheral zone, it may be provided with perforations or weakening stampings 42, preferably extending radially.

The web 28 thus prepared by punching is passed to an extruder 30 (Fig. 8*a*) by which a thin film or coating of melted plastics material 43 is extruded on to the web 28, and by chilled pressure rolls 41, is pressed on to the web 28 to form a permanent bond therewith. At the same time the holes 9 and 10 are covered over by the plastics film. The web 31 so processed is wound on a magazine roll 32. (Such rolls are distributed to dairies or other packaging stations where contents are ready to be packed in containers made from the prepared material on the magazine rolls 32). Figs. 3*a* and 3*b* show section A-A taken from Fig. 2*a* and B-B taken from Fig. 2*b* respectively, including in each case a plastics layer 12 covering the holes 9 and 10, as well as the web. This is intended to constitute the inside of a container made from the material.

The roll 32 may be coupled to an automatic packaging machine 38 in which the web is converted to containers 40 of the kind shown in Fig. 1. As shown in Fig. 8*b* the web 31 from the roll 32 is passed to a device 14, 15 for the folding up and over of the edge zone of the discharge aperture 9. The function of the device is illustrated in Figs. 4*a* and 4*b*. Two operating stages are carried out by the device 14, 15. In a first stage a mandrel 14 is forced through the opening 9 or 10 and their cover films such as shown in Fig. 3*a* and 3*b*. As shown in Fig. 4*a* the mandrel is oversize, and the edge zone 13 of the hole is folded up, while the plastics layer 12 in the area of the aperture is stretched and ruptured. If the hole 9 is of the shape shown in Fig. 2*a*, the flap portions between adjacent points of the punched-out star are folded up along the crease lines 11. These flap portions 13 (Fig. 4*a*) stand up substantially vertically. The mandrel 14 is preferably profiled so that its cross-section substantially corresponds to the configuration formed by the crease lines 11, but it should not have any sharp edges which may damage and unintentionally sever the plastics layer exposed at the discharge aperture. While the plastics film should be ruptured it should also be stretched in such a manner that splits do not extend to the edge of the hole, 9 or 10. With the mandrel in the position shown in Fig. 4*a* the vertical edge zones 13 are folded over in a second stage operation by a reciprocating pressing device 15 which has a central hole 44 of substantially the same cross-section as the mandrel 14. The inner edges 45 of the pressure device 15, and its guiding surfaces 46, (which are preferably curved), cause the vertical edge portion 13 of the hole to fold over as shown in Fig. 4*b*, and to be pressed against the surface of the packaging material 8.

After the raising and folding over of the edge zones of the hole by the device 14, 15, the face of the web which is to be the inside of a container is covered with an inner cover strip 21 applied by a suitable device 34. This strip 21 is preferably a relatively thin thermoplastics film e.g. of polyethylene, which may be drawn off a magazine roll, cut to a suitable length by a cutting device (not shown), and sealed to the face of the web 31, (that is to say to the plastics layer 12 in Fig. 4*a* and 4*b*) so that the hole in the plastics layer 12 ruptured by the mandrel 14 is re-sealed and the hole rendered completely impervious. The inner cover strip 21 may be affixed in any convenient manner, but preferably by heat and pressure causing the surface of the strip 21 to be softened and bonded together with the surface of the plastics layer 12. By means of another cover-strip applicator 35, an outer cover strip 22 is affixed over the discharge aperture, and over the folded edge zones 13, so that these latter are retained substantially in their folded-down position. The cover strip 22 is preferably applied as a continuous strip drawn from a magazine roll, cut to the required length and extended over the web surface to cover the discharge aperture as well as the vent 5. The outer strip 22 is fixed to the outside of the packaging material along a relatively easily tearable joint, care being taken to leave unsealed an end lug, to serve as a pull-tongue or pull-lug. The outer cover strip 22 is preferably also firmly sealed to an area of the inner cover strip 21 facing it through the hole 9 or 10 and the vent 5. The adhesion between the two cover strips 21 and 22 in the area of the hole 9 or 10 should be so good that the inner cover strip 21 will certainly be ruptured when the outer cover strip 22 is torn open. To achieve its function the outer cover strip is preferably relatively non-elastic, and in most cases it will be advantageous to make the outer cover strip 22 a laminate comprising a non-elastic layer e.g. of paper, metal foil, polyester or the like, provided with a thermoplastics inside layer e.g. of polyethylene, which thus becomes the surface sealed to the thinner cover strip 21.

The web 36 prepared in the manner described above is subsequently fed to a packaging machine over an upper guide roller 37, and folded to form a tube 39 to which are delivered the intended contents. In the

machine 38 the tube 39 is then formed into containers by successive transverse sealings of the tube and shaping. For this purpose there are preferably provided crease-lines to facilitate the folding, the crease-lines being formed in advance in the web. The filled and closed packages 40 are discharged from the machine and are ready for distribution.

Fig. 6 shows a cross-section of a packaging container provided with an opening means in accordance with the invention. The material consists of a base layer 8 which has an inside coating 12 of a plastics material. In the material a discharge aperture 9 and a vent 19 are spaced from one another and the aperture 9 is located in the vicinity of a side edge 7 of the top of the package. The hole 9 has a folded-over edge portion 13 maintained in its folded-down position by an outer cover strip 22, which extends over hole 9 and its folded-over edge portion 13 as well as over the vent 19. The hole 9 is provided moreover with an inner cover strip 21 of a thin plastics material, which over the inside of the package covers the hole 9 and is sealed to the plastics coating 12 of the base layer 8. In the area 24 the outer cover strip 22 is sealed to the inner cover strip 21 facing it through the hole 9, and the seal between the two strips 21 and 22, as mentioned previously, should be of such strength that the inner cover strip 21 is ripped open with certainty when the outer, thicker cover strip 22 is torn open. The outer cover strip 22 should preferably be provided with a free pull-lug 23, which may be near the hole 9 and/or at the opposite end of the cover strip 22 close to the vent 19, (Fig. 6).

To open the package, the pull-lug 23 of the outer cover strip 22 is gripped between the fingers and is torn off, becoming detached from the upper end surface of the package, while at the same time the vent 19 is freed. When the strip 22 is removed a part of the inner cover strip 21 is torn out, as shown in Fig. 7, and a discharge aperture is formed in the package through which the contents can run out. When the outer cover strip 22 has been removed, the folded-over flaps 13 are no longer held down but rise somewhat, as shown in Fig. 7, to form an upstanding pouring edge. This pouring edge 13 may not be quite even if the hole has been punched out as a star, but a satisfactory flow is nevertheless obtained because the plastics film 26, formed by parts of the plastics layer 12 when split by the mandrel 14, tend to serve as a smooth cover for the irregular parts of the upstanding edges around the hole.

Figs. 5*a* and 5*b* show the folded-over portions 13 of the edge zone around the hole 9, 10 in plan view, before the outer cover strip 22 has been applied. As seen in Fig. 5*a* the triangular flaps 13 are folded back and over, whilst an extended plastics film 26 stretches between the points of the folded out flaps. To prevent the renting of this plastics film 26 too near the corner points between the folded-over triangular portions 13 there may be provided at the said corner points, enlarged punched-out portions 16, in the shape of circles or squares, these punched-out parts thus forming part of the punched-out discharge hole. The presence of these punched-out parts 16 facilitate the stretching of the plastics film 12 without any risk of the tearing extending as far as the corner points, and a relatively even upstanding plastics layer 26 round the edge of the enlarged discharge hole is thus obtained.

In Fig. 5*b* the enlarged discharge aperture 10 is shown after the edge zones 13 have been folded over, and it is apparent that ruptures 18 appear in the base layer when the edge zone 13 is folded over, while the plastics layer 26 can be folded over round the edge of the enlarged hole 10 without any breaks appearing in the plastics layer extending inwards as far as the edge of the enlarged hole.

The opening means described herein have been found to allow good pouring and to be relatively easy and cheap to manufacture. The base layer 8 of the web material has an elasticity which is such that the folded-over edge zone rises somewhat when the outer cover strip 22 is removed, and also the inner plastics material 12 is such that it is not split by the mandrel 14 fully to the edge of the enlarged hole, so that around the opening an upstanding plastics edge 26 is present after the outer cover strip 22 has been removed.

In the foregoing, two configurations of the discharge aperture have been described, namely a star-shaped and a round hole. The invention is not limited, however, to these configurations, but may well make use of a square hole or one provided with flaps, or to a star-shaped hole with desired number of star-points. If a star-shaped hole with four points is used, the star should be so located, in relation to the adjacent side edge of the package, that a line between two of the adjacent points of the star will run substantially parallel to the said side edge.

WHAT WE CLAIM IS:—

1. Packaging material in sheet or web form, for forming containers, provided with an aperture sealed by a removable cover, adapted to serve as a discharge outlet in a container formed from the material wherein the peripheral zone of the aperture is folded back upon the surface of the material round the aperture and a strip of material forming said removal seal, extending over said aperture and said folded-back peripheral zone is bonded to the surrounding surface of the

packaging material.

2. Packaging material as claimed in Claim 1 wherein said aperture is also closed and sealed by a strip of material bonded to the opposite face of the material.

3. Packaging material as claimed in Claim 2 wherein facing areas of said two cover strips are bonded together within said aperture.

4. Packaging material as claimed in Claim 1, 2 or 3 in the form of a laminate.

5. Packaging material as claimed in Claim 4 wherein the laminate comprises a base layer with an outer plastics layer on one, or on each, face.

6. Packaging material as claimed in Claim 4 or 5 wherein the laminate comprises a layer of material having a high degree of imperviousness to gas.

7. Packaging material as claimed in Claim 6 wherein said gas-impervious material is metal foil or polyvinylidene chloride.

8. Packaging material as claimed in Claim 4, 5, 6 or 7 wherein the base layer of said laminate is of paper or of a foamed plastics material.

9. Packaging material as claimed in any preceding claim comprising adjacent to said aperture, but at a selected spacing therefrom a second sealed but openable aperture adapted to serve as a vent when a container made from said material is opened.

10. A method of preparing sheet or web packaging material formed of, or incorporating, a layer pre-formed with an aperture, wherein a mandrel of larger transverse dimensions than said aperture is forced through the aperture to initiate folding of the peripheral zone of material round the aperture, whereafter folding of said peripheral zone is completed by pressing it down against the surface of the material surrounding the aperture, and a seal extending over said aperture and said folded peripheral zone is bonded to the surrounding area of the material surface.

11. A method as claimed in Claim 10 wherein a seal extending over said aperture is bonded to the opposite face of the material.

12. A method as claimed in Claim 11 wherein facing areas of said two seals are bonded together within said aperture.

13. A method as claimed in Claim 10, 11 or 12 wherein a sheet or web provided with an aperture is coated with a layer of plastics material, which extends over said aperture, and the plastics-covered aperture thereafter presented to said mandrel which ruptures said plastics covering in the course of initiating folding of the peripheral zone of material round the aperture.

14. A method as claimed in any of Claims 10-13 wherein an end portion of the sealing strip covering the aperture and its folded-over peripheral zone is left free of attachment to the surface of the packaging material, in order to serve as a tear-lug for opening a package formed from the material.

15. A method as claimed in any of Claims 10-14 wherein said initial aperture is star-shaped.

16. A method of forming, filling and sealing a package wherein packaging material substantially as claimed in any of Claims 1-9 or prepared by a method substantially as claimed in any of Claims 10-13, is formed into a tube which at its end is transversely sealed, the tube being then filled with intended contents, transversely sealed at spaced intervals, and separated into individual packages.

17. Apparatus adapted to carry into effect a method substantially as claimed in any of Claims 10-16 comprising a mandrel for forced insertion into said aperture in order to initiate folding of the peripheral zone of the aperture, and a co-operating pressure member adapted to encircle said mandrel and to press down against the surrounding surface of the packaging material the said peripheral zone raised by said mandrel.

18. Apparatus as claimed in Claim 17 comprising extruder means adapted to provide a sealing cover strip of plastics over said aperture and its folded peripheral zone, and bonded to the surrounding material, after said mandrel and pressure member have completed the said folding operation.

19. A package-forming, — filling and — sealing machine incorporating packaging-material substantially as claimed in Claim 17, 18 or 19, to form, fill and seal a package formed from material prepared thereby.

20. A method of preparing packaging material substantially as described herein with reference to the accompanying drawings.

21. Apparatus for preparing packaging material substantially as described herein with reference to the accompanying drawings.

22. A packaging machine incorporating apparatus for preparing the packaging material substantially as described herein with reference to the accompanying drawings.

23. Packaging material provided with a sealed aperture substantially as described herein with reference to the accompanying drawings.

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2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 1

Fig. 5a

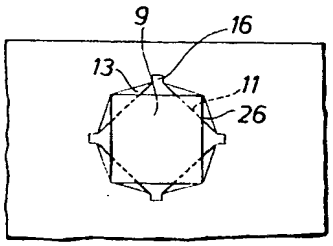


Fig. 5b

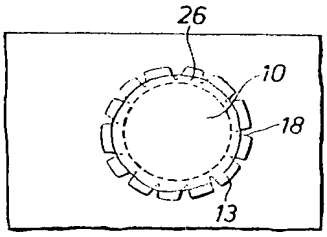


Fig. 6

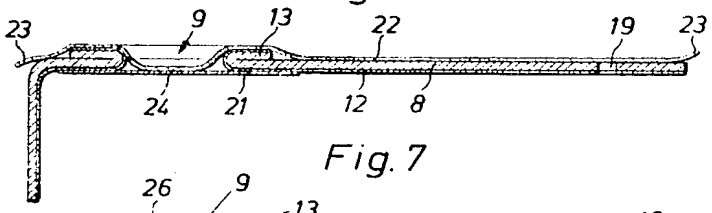


Fig. 7

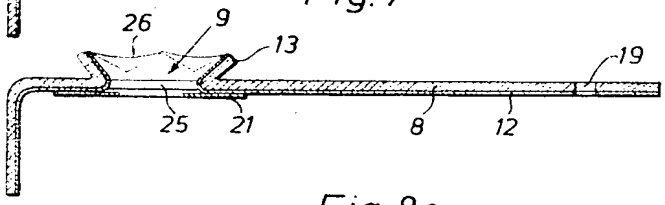


Fig. 8a

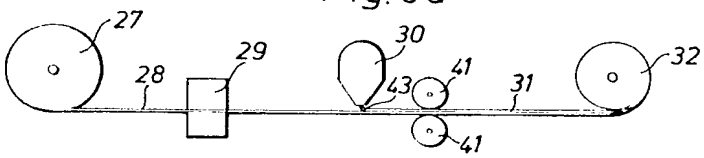


Fig. 8

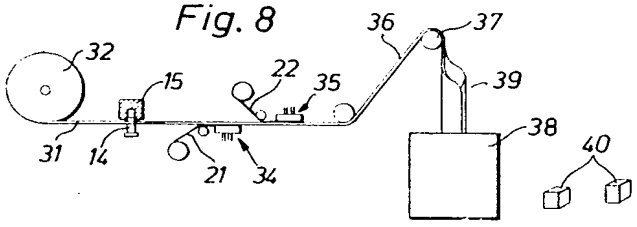


Fig.1

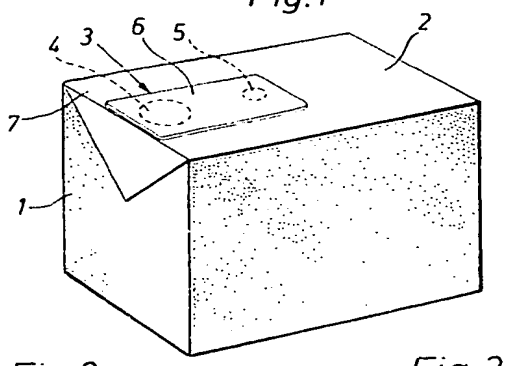


Fig.2a

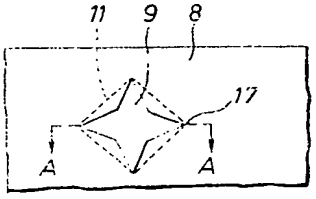


Fig.2b

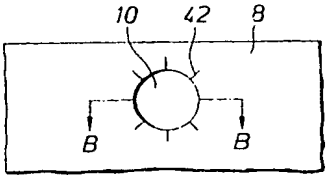
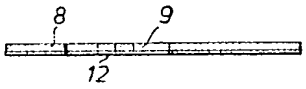
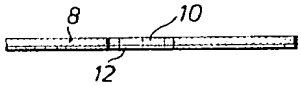


Fig.3a



A-A

Fig.3b



B-B

Fig.4a

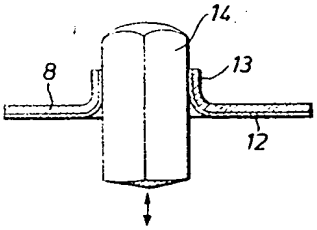
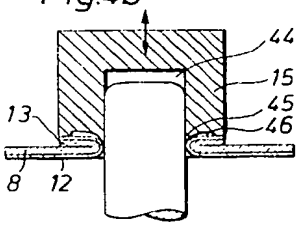


Fig.4b



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